

## A NEW AMERICAN GENUS OF ARIONIDÆ.

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Among other mollusks received from the Rev. E. H. Ashmun, the fruits of his first season's collecting in Idaho, were a few small slugs, about the size of *Agriolimax campestris* (Binn.). The dark color, carinated tail and tripartite sole led me, upon first glance, to think it an immature *Amalia*; but subsequently, upon opening one to confirm the identification, it became at once obvious that an Arionid slug was before me—a slug not referable to any hitherto known species. This slug shall be called *Zacoleus idahoensis*. It is from Meadows, Washington county, Idaho.<sup>1</sup>

**ZACOLEUS**, gen. nov.

The genus *Zacoleus* may be briefly defined thus: Ariolimacinae with the penis a simple sac continued beyond the insertion of the vas deferens; duct of the spermatheca enormously enlarged; marginal teeth with very long zonitoid mesocones, no ectocones; intestine but slightly twisted; sole tripartite; pneumostome behind the posterior third of the mantle; no caudal pore. Central nervous system peculiar by the unusually long cerebral commissure and very short cerebro-visceral and cerebro-pedal connectives.

**Zacoleus idahoensis** n. sp.

Externally the slug is black on the mantle and back, the flanks and head lighter, slate-colored; the neck or area around the anterior border of the mantle is dirty white. The reticulation is indistinct, and longitudinal lines above, oblique on the sides, predominate, somewhat as in *Prophysaon caruleum* (Ckll.). Back of the mantle the body is keeled, the tail strongly so. The foot-margin is rather narrow. The sole is narrow, yellowish-white, and divided by longitudinal grooves into three subequal areas. There is no caudal pore, but the acute tail appears somewhat abruptly truncate posteriorly in a view of the profile. The oval mantle somewhat exceeds one-third the length of the body. The pneumostome is situated between the

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<sup>1</sup> I am indebted to Mr. E. G. Vanatta for assistance in the examination of these slugs.

posterior third and fourth of its length. One of the largest individuals measures, length 14, breadth of sole 1.3 to 1.5, length of mantle 5.5 mm. In more contracted individuals the sole is somewhat broader in front.

The wholly buried shell is calcareous and moderately strong, oblong, a little convex, the left side more straightened than the right, the slightly projecting blunt apex being terminal. The surface is marked with growth-striae, and seems to be without periostracum. Length 2.5, width 1.5 mm.

The free retractor muscles are arranged as in *Hesperarion* and its allies, the ocular retractors and the pharyngeal retractor being independent bands converging to the posterior edge of the mantle-cavity where they are inserted in a group (Pl. XXVIII, fig. 6).

The genitalia (Pl. XXVIII, fig. 5) were imperfectly worked out.<sup>2</sup> The penis (*p.*) is a stout, oblong sac receiving the vas deferens a little distad of the middle of its length, and its lumen is there contracted by a fleshy transverse body or sort of valve. Above this the walls are thicker. Both divisions are smooth within. The small spermatheca (*sp.*) is defined by a constriction from the duct (*sp. d.*), which is a very capacious sac, longer than the penis, opening directly into the atrium. Internally this relatively enormous duct has a few coarse longitudinal folds, the number increasing toward the distal end where they are numerous. Its structure, aside from size, is therefore what is ordinarily encountered.

No retractor muscle of the penis was seen, probably owing to the ill preservation of the specimen, or to imperfect attention in the early stage of the dissection. The terminal duct only of the ♀ system could be traced (*ov.*).

The alimentary canal is constructed on the usual Arionid type, though less twisted than in the related genera. The jaw is opaque, very thin, arcuate, and composed of numerous dark plaits or flat ribs separated by thin, transparent, much narrower intervals. In one specimen examined there are over twenty-five narrow ribs (Pl. XXVIII, fig. 3); in another the ribs are much wider and not so numerous (Pl. XXVIII, fig. 2).

The crop is long and capacious, hardly separated from the stomach.

The intestine (Pl. XXVIII, fig. 4) is of the usual four-folded type, the anterior loop caught in the cephalic artery. It is curved in figure

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<sup>2</sup> The spirit first used on the specimens was apparently too weak to properly preserve the viscera; and the genitalia and intestine were so soft and tender that their dissection was difficult.

S fashion, but only slightly twisted. As in other native American *Arionida*, the posterior loop formed by the first and second folds of the intestine lies anterior to that formed by the third and fourth folds.

The radula has 31.1.33 teeth in two individuals counted. The median tooth is tricuspid, the lateral teeth bicuspid, both being of the type frequently figured for American *Arionida*. There are seven laterals on each side (Pl. XXVIII, fig. 7). The change to the marginals is gradual, and produced by lengthening the main cusp and diminution of the ectocone (Pl. XXVIII, fig. 8). The division of the lateral and marginal fields of the radula (between the seventh and eighth teeth) is obvious in a general view of the ribbon under a low power. The marginal teeth (Pl. XXVIII, figs. 9, 10, 11) have the basal plates shortened, a single long, lance-shaped cusp springing therefrom. These cusps are rather broad on the inner (fig. 9) and the outer (fig. 11) teeth, but long and graceful in the middle of the marginal field (fig. 10).

The central nervous system (Pl. XXVIII, fig. 1) has the commissure between the cerebral ganglia long, even for an Arionid slug. These ganglia are obscurely bilobed. The cerebro-pedal and cerebro-visceral connectives are, on the other hand, excessively short. The sub-oesophageal group of ganglia exhibits strong concentration, with the exception of the pedal mass.

#### AFFINITIES OF *ZACOLEUS*.

The contiguous posterior insertions of the free retractor muscles and the long cusps of the marginal teeth show that this genus belongs to the subfamily *Ariolimacina* as defined by Pilsbry and Vanatta.<sup>3</sup> The tripartite sole, peculiar genitalia, total absence of ectocones on the Zonitoid marginal teeth, and the extreme shortening of the side connectives of the circumoesophageal ring, all distinguish this genus from its allies. The tripartite sole it has in common with *Binneya* and *Anadenulus*, both of which differ conspicuously in more important features. Perhaps the tripartite sole was a character of the primitive *Aulacopoda*. It seems to occur somewhat sporadically in some genera of several widely separated families of that group. There is no indication of the auto-urotomy (to coin a word) of *Prophysaon* in our new genus. *Zacoleus* thus stands isolated among known genera. Notwithstanding its strictly aculeate type of marginal teeth, *Zacoleus*

<sup>3</sup> Pilsbry and Vanatta, *Proc. Acad. Nat. Sci. Phila.*, 1898, p. 227; Pilsbry, *Proc. Malac. Soc. London*, III, p. 100.

is evidently a herbivorous slug. The crop and stomach of the specimen dissected were filled with the curiously marked leaves of *Frullania* (Jungermanniaceæ).

EXPLANATION OF PLATE XXVIII.

Fig. 1.—Central nervous system of *Zacoleus idahoensis*.

Figs. 2, 3.—Jaws.

Fig. 4.—Intestine.

Fig. 5.—Genitalia: *o*, common external orifice; *ov.*, oviduct; *p.*, penis; *sp.* spermatheca; *sp.d.*, duct of the spermatheca.

Fig. 6.—Free retractor muscles.

Figs. 7-11.—Teeth.